

Figure 4. —A. Panicle of *Chascolytrum latifolium*. —B. SEM image of the lemma base in dorsal view for *C. altimontanum*. The arrow indicates the flattened trichomes.

(HBR, MO, S); Campo dos Padres, 22 Jan. 1957, *B. Rambo s.n.* (B 1001176910); Lauro Müller, a 25 km pasando la Serra do Rio do Rastro, 7 Dec. 1992, *Z. Rúgolo, H. M. Longhi-Wagner, S. Boechat & M. Molina 1478* (MO); Porto União, 27 Oct. 1962, *R. Reitz & R. M. Klein 13670* (HBR); Porto União, S. Miguel, 29 Dec. 1936, *B. Rambo s.n.* (HBR 2643); São Joaquim, bosque com *Araucaria* perto do mirante, próx. à desc. da Serra do Rio do Rastro, 30 Jan. 2003, *H. M. Longhi-Wagner 8759* (ICN). **São Paulo:** Campos do Jordão, 9 Dec. 1995, *H. M. Longhi-Wagner & K. Witten 2793* (ICN).

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# The *Astragalus minimus* (Leguminosae, Galegeae) Complex and One New Species for Chile and Argentina

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**ABSTRACT.** *Astragalus minimus* Vogel (Leguminosae) is endemic to the Andean region of South America, in Peru, Bolivia, Chile, and northwestern Argentina. This taxon belongs to a pulvinate species complex in the genus *Astragalus* L. (Leguminosae, Galegeae) from high mountain puna vegetation, between 4000 and 4500 m in the Neotropics. The *A. minimus* complex is newly delimited, in particular with information for the fruit, which was not described in Vogel's 1843 protologue. This new information allows the identification of *A. tacorensis* Gómez-Sosa as a species new to science; both taxa are morphologically described and illustrated.

**RESUMEN.** *Astragalus minimus* Vogel (Leguminosae) es endémica de la región andina de América del Sur, en Perú, Bolivia, Chile y noroeste de Argentina. Este taxon pertenece a un grupo o complejo de especies pulvinadas del género *Astragalus* L. (Leguminosae, Galegeae) de alta montaña de los Andes en vegetación de puna, entre 4000 y 4500 m en el Neotropico. El complejo de *A. minimus* es nuevamente delimitado e incluye información, particularmente de fruto del ejemplar tipo, no descrito previamente en el protologo de Vogel (1843). Esta nueva información permite la identificación de *A. tacorensis* Gómez-Sosa como una nueva especie para la ciencia; ambos taxa son morfológicamente descritos e ilustrados.

**Key words:** Argentina, *Astragalus*, Bolivia, Chile, Galegeae, IUCN Red List, Leguminosae, Peru.

One group of South American *Astragalus* L. (Leguminosae, Galegeae) has in common principally vegetative aspects; these plants are diminutive, matted or tufted, acaulescent herbs with a branched caudex thatched with marcescent stipules. For this reason, flower and fruit characters are necessary for taxonomic identification, and consequently many herbarium collections are misnamed. The two taxa presented here belong in this group with pulvinate vegetative forms.

The type for *Astragalus minimus* Vogel was collected in Peru by Meyen in 1831 and the species was later published by Vogel (1843), but the pro-

tologue lacked description of the fruits. Macbride (1943: 398), in the *Flora of Peru*, presented flower and fruit characteristics with respect to the specimen *Werdermann 1136* cited by I. M. Johnston (B, G), who did not examine Meyen's type collection. Johnston (1947) did not include a description for *A. minimus*, but did comment that "our present species frequently has the fruit elevated on a short but definite 1–2-flowered peduncle 2–6 mm long," and further added in the key: "flowers solitary or geminate, fruit with a more or less incomplete membranous false septum; valves rather firm and tough" (Johnston, 1947: 344). Those characteristics correspond to the Werdermann collection, but do not correlate with the Meyen type.

Study of the type specimen of *Astragalus minimus* at P allows the description of the hitherto unknown and evanescent fruit and the identification of a new species:

## 1. *Astragalus tacorensis* Gómez-Sosa, sp. nov.

**TYPE:** Chile. Tacna: Cordillera Volcán Tacora, 4300 m, Apr. 1926, *E. Werdermann 1136* (holotype, G; isotypes, B, LIL, SI, TUC, US). Figures 1, 3A, B.

Haec species *Astragalo minimo* Vogel similis, sed ab eo foliis longioribus, pedunculo 0.5 cm longo, floribus pedicellatis, legumine oblique ovoideo 6–7 mm longo subbiloculari septo membranaceo incompleto diviso atque seminibus numerosioribus distinguitur.

Diminutive, matted or tufted, pulvinate herbs appearing acaulescent, with branched caudex thatched with membranous, amplexicaul, glabrescent stipules. Foliage white pubescent to glabrescent; leaves 1.5–2 cm; leaflets 9 to 15, distantly spaced, oblong, apex retuse, folded, adaxially glabrous or finely and scattered pubescent only at margin and abaxially. Peduncles ca. 0.5 cm, (1)2-flowered, immersed in foliage or scarcely exerted; pedicels ascending, 1–2 mm. Calyx 2.5–4 mm, pubescent; banner 5.5–6.5 × 2.5–3.5 mm; wings ca. 3.5 mm; ovary white pubescent; ovules 8(to 10). Pods white, finely strigulose, obliquely ovoid, 6–7 × ca. 2.5 mm,



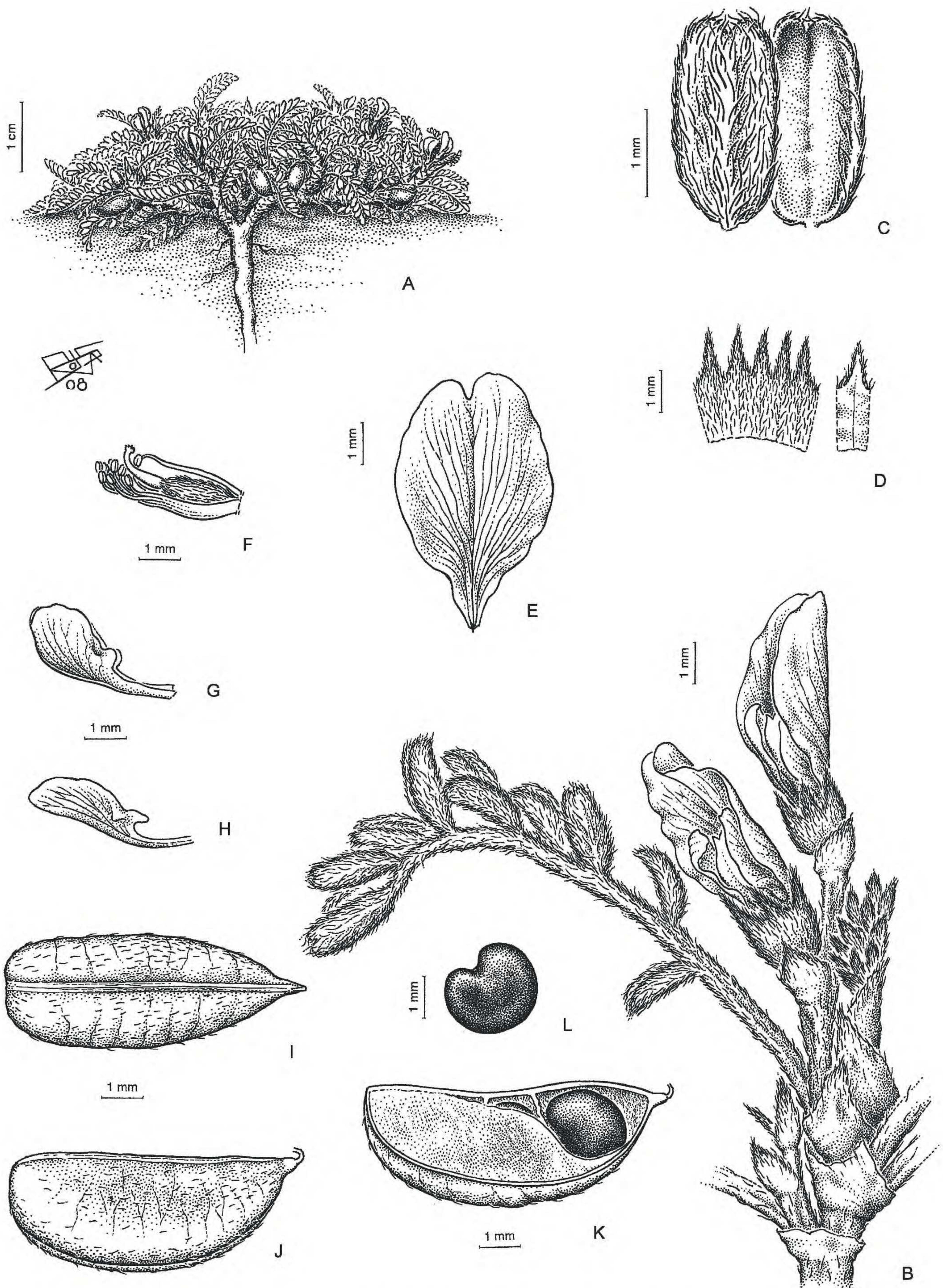


Figure 1. *Astragalus tacorensis* Gómez-Sosa. —A. Plant habit. —B. Apex of branch with flowers. —C. Leaflet, abaxial view (left) and adaxial view (right). —D. Calyx, with internal view of tooth at right. —E. Banner. —F. Androecium and gynoecium. —G. Keel. —H. Wing. —I. Fruit, dorsal view. —J. Fruit, lateral view. —K. Fruit, longitudinal section with the partial septa and seeds visible. —L. Seed. Based on the holotype *Werdermann 1136* (G).



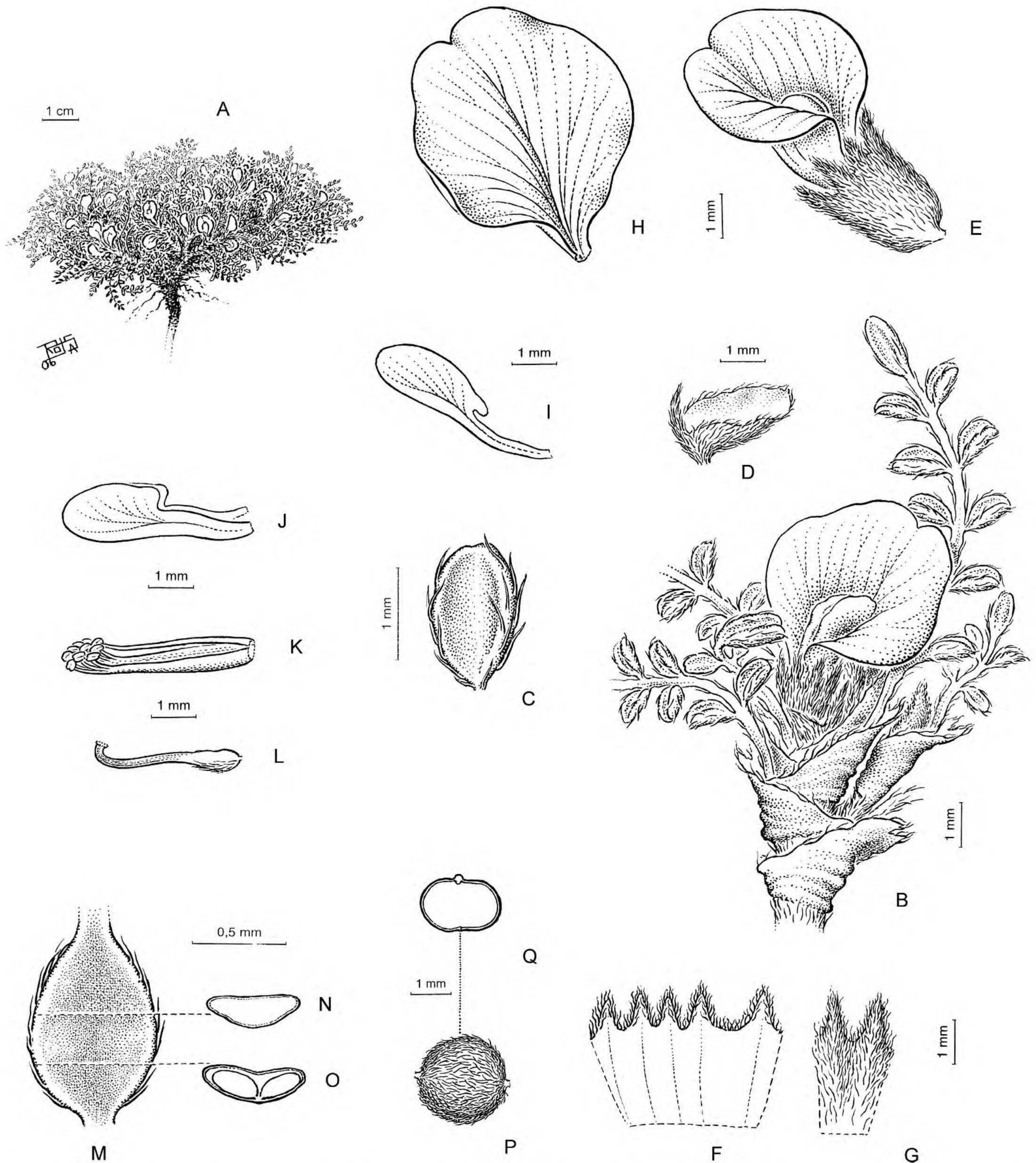


Figure 2. *Astragalus minimus* Vogel. —A. Plant habit. —B. Apex of branches with flower. —C. Leaflet, adaxial view. —D. Bract. —E. Flower. —F. Calyx, internal view. —G. Calyx, external view. —H. Banner, internal view. —I. Wing. —J. Keel. —K. Androecium. —L. Gynoecium. —M. Ovary. —N, O. Ovary, cross section. —P. Fruit. —Q. Fruit, cross section. Based on the holotype *Meyen 67* (P).

slightly compressed laterally, shortly apiculate-beaked, valves papery, obtuse at base and apex, inflexed below middle of pod, subbilocular, with a membranous septum to 0.7 mm wide; seeds 4 to 7, reniform, generally smooth.

*Distribution and habitat.* *Astragalus tacorensis* occurs in northern Chile and northwestern Argentina, in high mountains at elevations of 3700–4500 m. The

type locality of Volcán Tacora, with a summit of 5988 m, is in northern Chile, in Parinacota Province, which is bordered to the north and west by Peru and to the east by Bolivia. Temperatures in the type locality are cool, averaging 4°C.

Werdermann collected in Chile and commented on the scarcity of cryptogamic plants in northern Chile versus plants with xeromorphic characteristics (Werdermann, 1931). He noted that the cold, dry wind



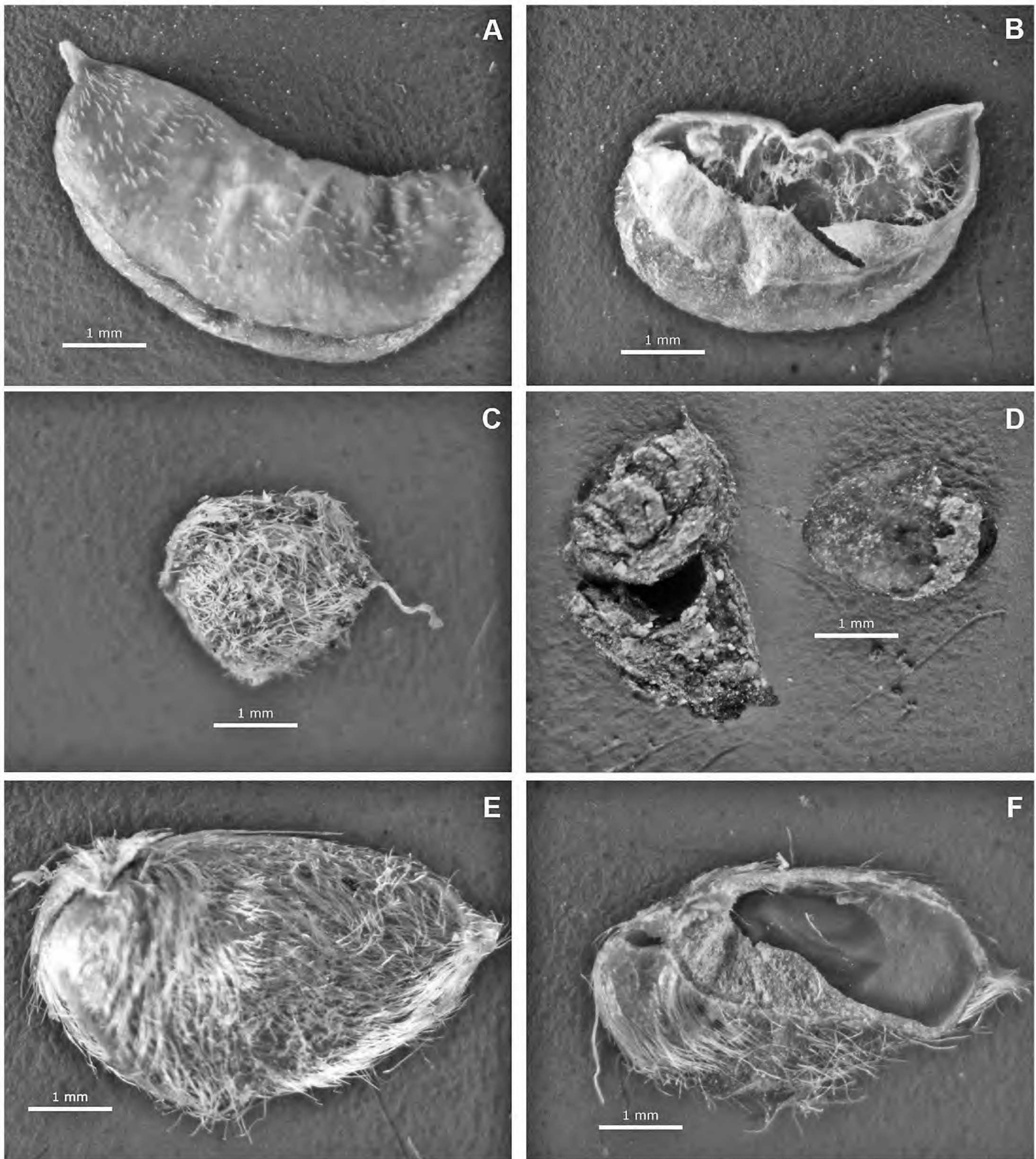


Figure 3. Fruit and seeds. A, B. *Astragalus tacorensis* Gómez-Sosa (from Kiesling *et al.* 5291, SI). —A. Intact fruit, lateral view. —B. Subbilocular fruit, longitudinal section showing the partial septa. C, D. *Astragalus minimus* Vogel (from Vargas 8439, SI). —C. Fruit, lateral view. —D. Evanescent fruit (left) and seed (right). E, F. *Astragalus peruvianus* Vogel (from Gómez-Sosa 166, SI). —E. Intact fruit, lateral view. —F. Fruit dissected to show the interior, lateral view. Scale bars = 1 mm.

necessitated a protective morphology, which is seen in plants with a smaller surface area and with a waxy, resinous, or pubescent protective covering to reduce transpiration. He also noted that conditions on the slopes of the inter-Andean valleys allowed the formation of extensive meadows, locally called vegas.

*IUCN Red List category.* *Astragalus tacorensis* is preliminarily evaluated as Vulnerable (VU) according

to IUCN Red List criteria (IUCN, 2001) because of the taxon's small population that is potentially at risk.

*Etymology.* The specific epithet refers to the type locality of Volcán Tacora.

*Paratypes.* ARGENTINA. **Jujuy:** Yaví, Quebrada de Salitre, 22°7'48"S, 65°39'49"W, 3523 m, 23 Feb. 1940, *F. Meyer 31465* (LIL, SI); Rinconada, Mina Pirquita, 4300 m, 5–12 Mar. 1981, *H. Schwabe, E. Ancibor & A. Vizinis 729a*



Table 1. Comparison of *Astragalus tacorensis*, *A. minimus*, and *A. peruvianus*.

	<i>A. tacorensis</i>	<i>A. minimus</i>	<i>A. peruvianus</i>
Caudex and branches (cm)	1–1.5	(0.5–)1–2	(0.5–)1
Stipules	membranous, glabrous to glabrescent	membranous, glabrous	scarious, glabrous
Leaflets			
Number	9 to 15	(7)9 to 11	7 to 13
Size (mm)	(0.5–)1–2	1–1.5	1–1.2
Shape	oblong	elliptic to oblong	elliptic to ovate
Apex	retuse	obtuse	obtuse
Pubescence	fine and scattered abaxially and at margin	white villous abaxially, glabrous adaxially	silvery villous on both surfaces
Peduncle (cm)	ca. 0.5	0	0
Flowers			
Number	(1)2	1(2)	1(2)
Length (mm)	5.5–6.5	4–6(–8)	6–7
Ovules	8(to 10)	2	6
Legume	subbilocular, septate 3/4 from base	unilocular, not septate	subbilocular, septate at base
Length (mm)	6–7	2.5–3.5	4–5 × ca. 3
Consistency	papery	membranous-evanescent	tough (thick)
Pubescence	white strigulose	white villous	silvery villous
Seeds	4 to 7	1(2)	5

(SI); Humahuaca, 10 km from Cienzo to Santa Ana, Abra de Zenta, 23°10'S, 65°02'W, 4500 m, 12 Feb. 1998, *O. Morrone, N. Deginani, A. Cialdella & L. Giussani 2477a* (SI); Hornaditas, 20 Jan. 1976, *R. A. García 584* (SI); Tres Cruces, en vega [meadows], 3700 m, 4 Mar. 1997, *R. Erschb 9789* (Hb. Traer, SI); Tumbaya, El Moreno, Ciénaga Grande, 16 Feb. 1985, *R. Kiesling, S. Botta, C. Ezcurra, M. Sanchez & E. Ulibarri 5291* (MO, SI). **Salta:** San Antonio de los Cobres, 21 Feb. 1927, *A. Castellanos s.n.* (G, SI). **Tucumán:** Cumbres Calchaquíes, Huaca-Huasi, 4270 m, 26 Dec. 1977, *S. Halloy 866* (SI, TUC).

**2. *Astragalus minimus*** Vogel in Meyen, emend. Gómez-Sosa, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1). 1843. TYPE: Peru. Altos de Toledo, Apr. 1831, *F. J. Meyen 67* (holotype, P ex hb. Bunge-Berlin). Figures 2, 3C, D.

Depressed pulvinate herb, 2–5 cm diam., acaulescent, caudex (0.5–)1–2 cm, stoutly branched, stipules amplexicaul, membranous, hyaline, glabrous, ciliate. Leaves 4–8(–15) mm; leaflets (7)9 to 11, opposite, folded, in outline elliptic to oblong, thickened, apex obtuse, white villous abaxially, glabrous adaxially. Flowers 1(or 2), sessile, 4–6(–8) mm; bracts 1.5–2.5 mm, subulate, ciliolate, pubescent; calyx 2–3 mm, pubescent; banner 5–7 × 3.5–4.5 mm, with the claws very short and included, obovate to subcircular; wings and keel shorter than banner; ovary pubescent, style incurved at apex; ovules 2. Legume unilocular, 2.5–3.5 mm, subglobose, valves membranous, evanescent, concealed by persistent petals, bract, and stipule; seed 1(2), generally mottled.

*Distribution.* *Astragalus minimus* is a regional endemic to western South America and is possibly sympatric with *A. diminutivus* (Phil.) Gómez-Sosa, which also forms pulvinate cushions and is found in the Neotropical subregion and biogeographic province of Puna (Zarucchi, 1993; Gómez-Sosa, 2005, 2008).

The only location information noted for the Meyen type is vague (“Peru, Altos de Toledo”), and its exact collection locality is not known. Macbride (1943: 399) cited only “Puno: above Toledo” and Johnston (1947: 404) noted “Arequipa: Alto de Toledo”; both occur in southern Peru. The Arequipa–Puno area is between 16–18°S, 70–72°W.

*Discussion.* *Astragalus minimus* is similar to the pulvinate species *A. peruvianus* Vogel (Fig. 3E, F). *Astragalus minimus*, *A. peruvianus*, and *A. tacorensis* are compared in Table 1.

*Additional specimens examined.* ARGENTINA. **Jujuy:** Humahuaca, Abra de Aparzo, *N. Deginani et al. 405* (SI). BOLIVIA. **La Paz:** Charaña, *E. Asplund 6145* (US). CHILE. **Tarapacá:** Laguna Chungaró, *O. Zoellner 3044* (SI). PERU. **Arequipa:** Prov. Islay, lomas de Mollendo, *C. Vargas C. 8439* (SI).

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